

Trout and Toxics in the Upper Delaware Basin:

Understanding a contaminant
of emerging concern

Friends of the Upper Delaware Rendezvous

October 16, 2024

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Delaware River Basin Commission

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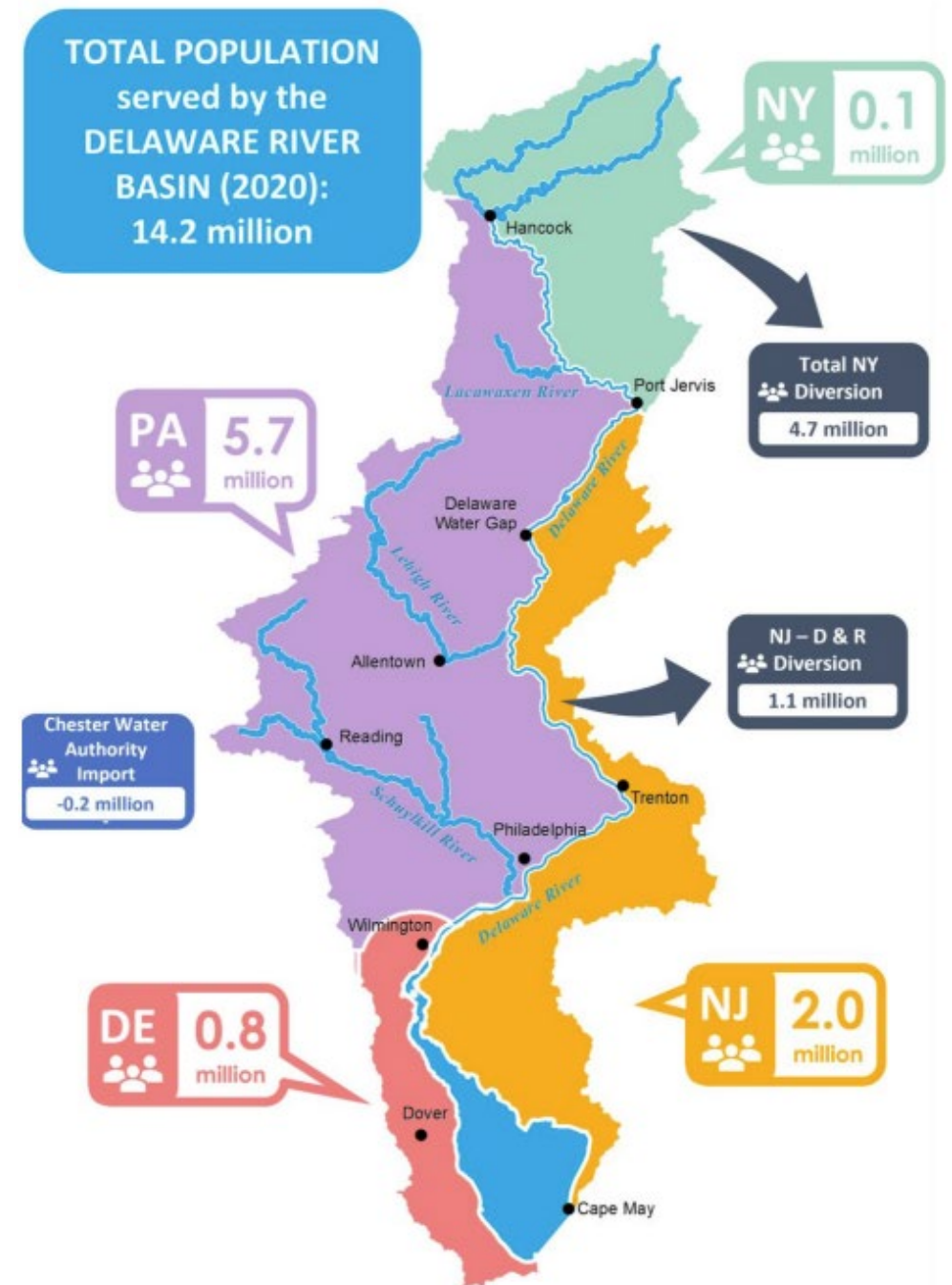
The Delaware River

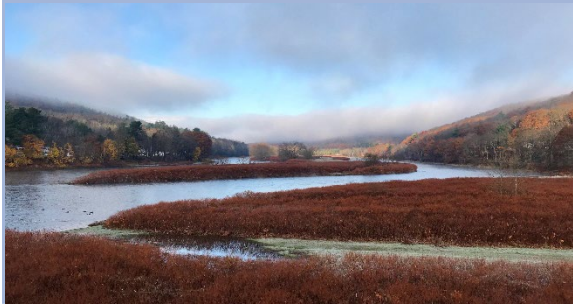
- 330 miles
- Tidal from ocean to Trenton, NJ
- Unique habitats and communities
- 13,500 sq. mi. watershed
- Free-flowing mainstem



The Delaware River meets our needs

- >14 million people in four states
- Half of NYC drinking water
- Four states
- 6.4 billion gallons withdrawn daily
- >\$21 billion in economic value
- Interstate boundary





Introduction to the DRBC



6-PPDq – Preliminary Results



Connecting with Local Knowledge



Q&A

Delaware River Basin Commission 101



The Delaware River Basin Commission is a federal-interstate Compact agency established in 1961.



Our Mission

Manage, protect, and improve the water resources of the Delaware River Basin.

Our Vision

Provide trusted, effective, and coordinated management of the Basin's shared water resources.



Commissioners of the DRBC



New York Governor Kathy Hochul,
DRBC Chair



Delaware Governor John Carney,
DRBC Vice Chair



North Atlantic Division Commander
U.S. Army Corps of Engineers BG John Lloyd



Pennsylvania Governor Josh Shapiro



New Jersey Governor Phil Murphy



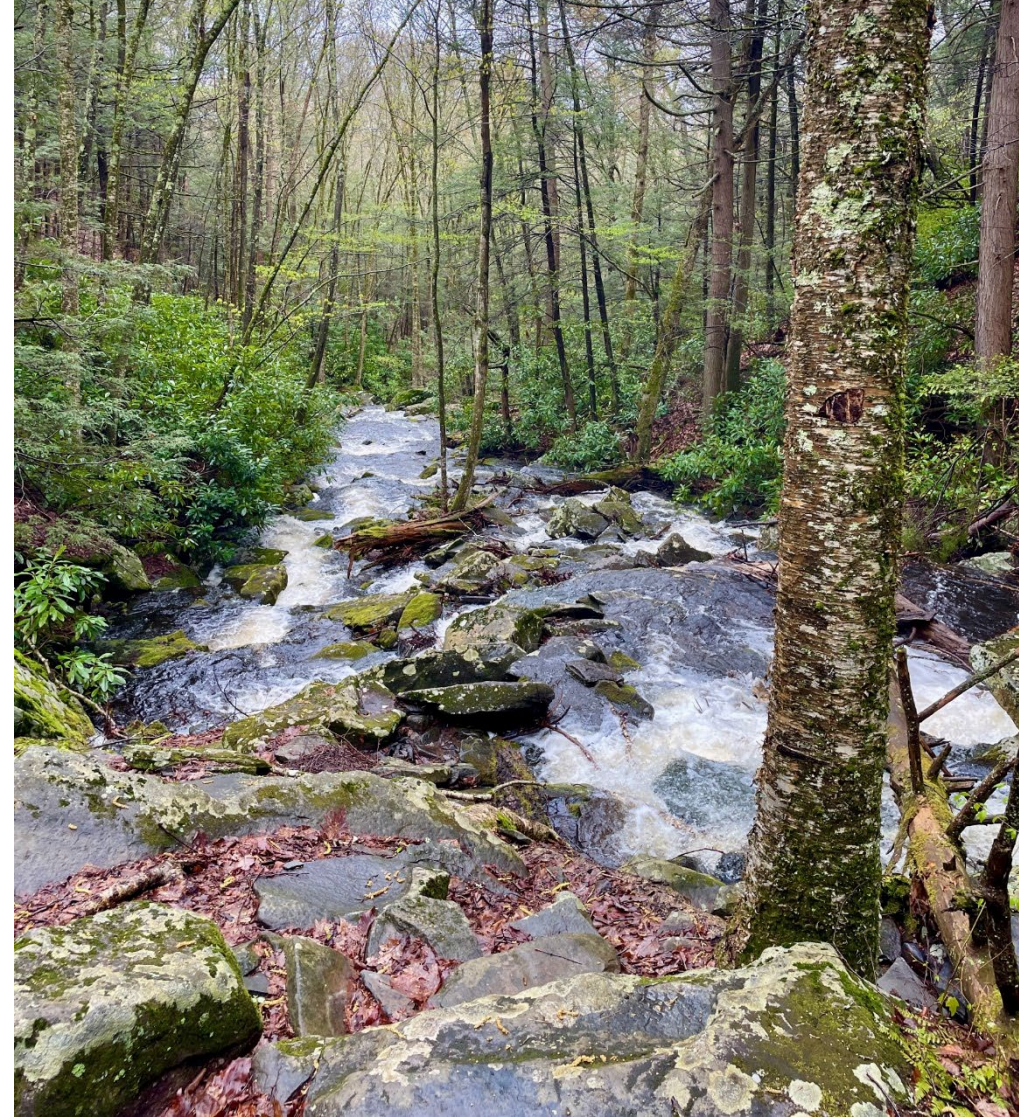
The DRBC's authority and jurisdiction are defined by the Delaware River Basin Compact.

- U.S. Constitution, Compact Clause, Article 1, Section 10, Clause 3.
- Pub. L. 87-328, 75 Stat. Ann. 688 (1961).
- Recognized as a regional asset with local, state and national interests.

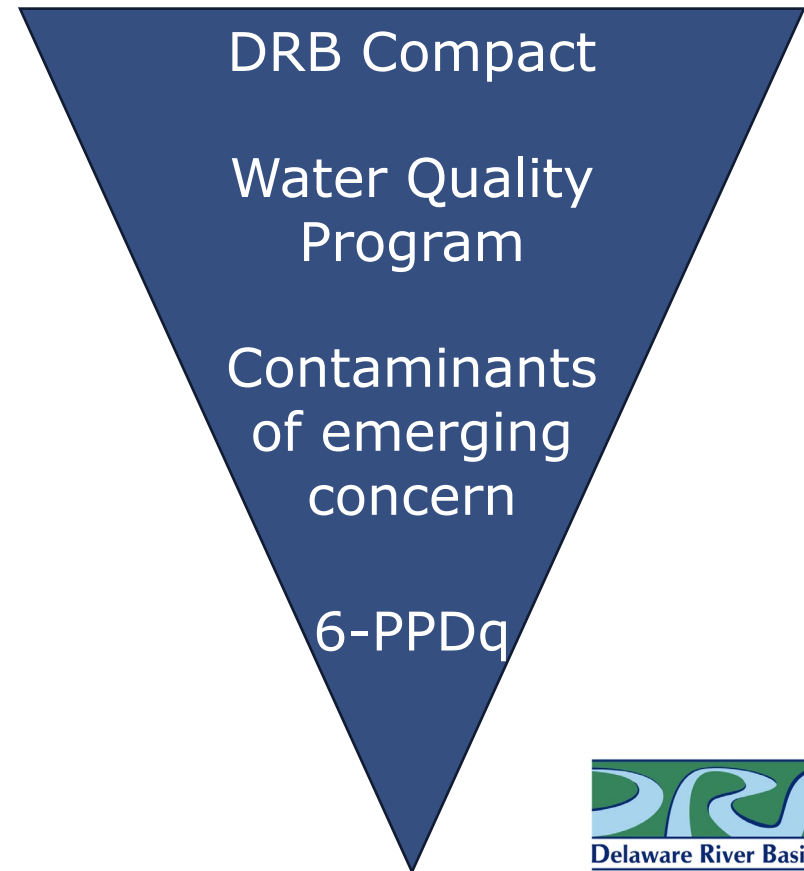


The DRB Compact includes broad authority for planning and regulation.

- Abatement and control of pollution
- Development of ground and surface water supply
- Development of recreational facilities
- Protection and aid to fisheries
- Promotion of watershed projects
- Development of hydroelectric power
- Control of movement salt water
- Flood damage reduction



The DRBC has a mandate to protect and restore water quality in the Delaware River Basin.



6-PPDq in the Delaware Catchment: preliminary results

2024 FUDR Rendezvous
Callicoon, NY
10/16/24

Jeremy L. Conkle, Ph.D. Sr. Chemist/Toxicologist
Gangadhar Andaluri, Temple University
Kavya Somepalli, Temple University



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Managing, protecting and improving the water resources of the Delaware River Basin

- National Fish & Wildlife Foundation Delaware Watershed Conservation Fund (304_DWCF-23)
- USEPA Water Pollution Control Grant (106 Grant)



Death by dirty water: Storm runoff a risk for fish



POULSBO, Wash. -- Just hours into the experiment, the prognosis was grim for salmon that had been submerged in rain runoff collected from one of Seattle's busiest highways. One by one, the fish were removed from a tank filled with coffee-coloured water and inspected: They were rigid. Their typically red gills were gray.

"He's way dead," David Baldwin, a research zoologist with the National Oceanic and Atmospheric Administration's Northwest Fisheries Science Center, declared at the four-hour mark.

Monday, November 17, 2014



<https://www.ctvnews.ca/sci-tech/death-by-dirty-water-storm-runoff-a-risk-for-fish-1.2105589>

In the Pacific Northwest, contamination in rain runoff is killing salmon before they can spawn



Monday, November 17, 2014

<https://www.youtube.com/watch?v=RCqmFZZOMGg>

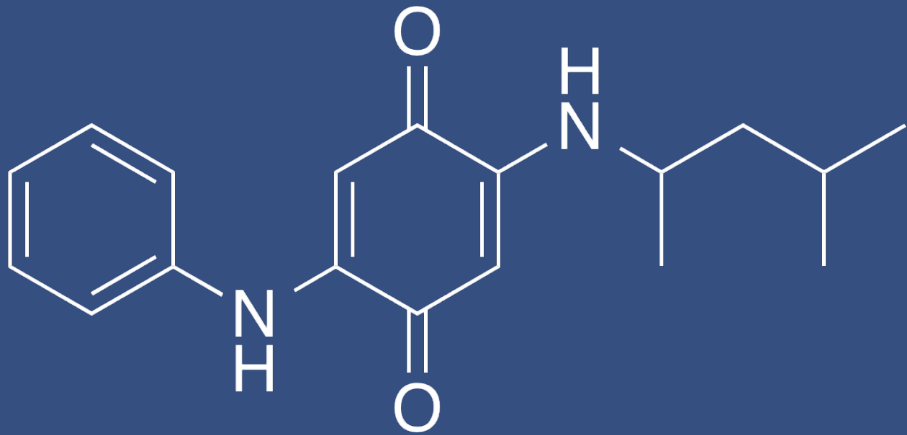
Tire Wear Particles

7-12 lbs generated annually per person in the U.S.

What makes Tire Wear Particles Toxic?



6-PPD & 6-PPDq: *Background and Properties*



- 6-PPD is used in tires and other rubber car parts
- Environmental behavior & properties not well known
 - 6-PPD solubility 0.5 to 2 mg L⁻¹
 - Half-life in water is hours to <1 day
 - 6-PPDq solubility 0.67 to 51.34 mg L⁻¹
 - Half-life in water is 33 hrs
 - Bonds with sediment

6-PPDq Toxicity... so far



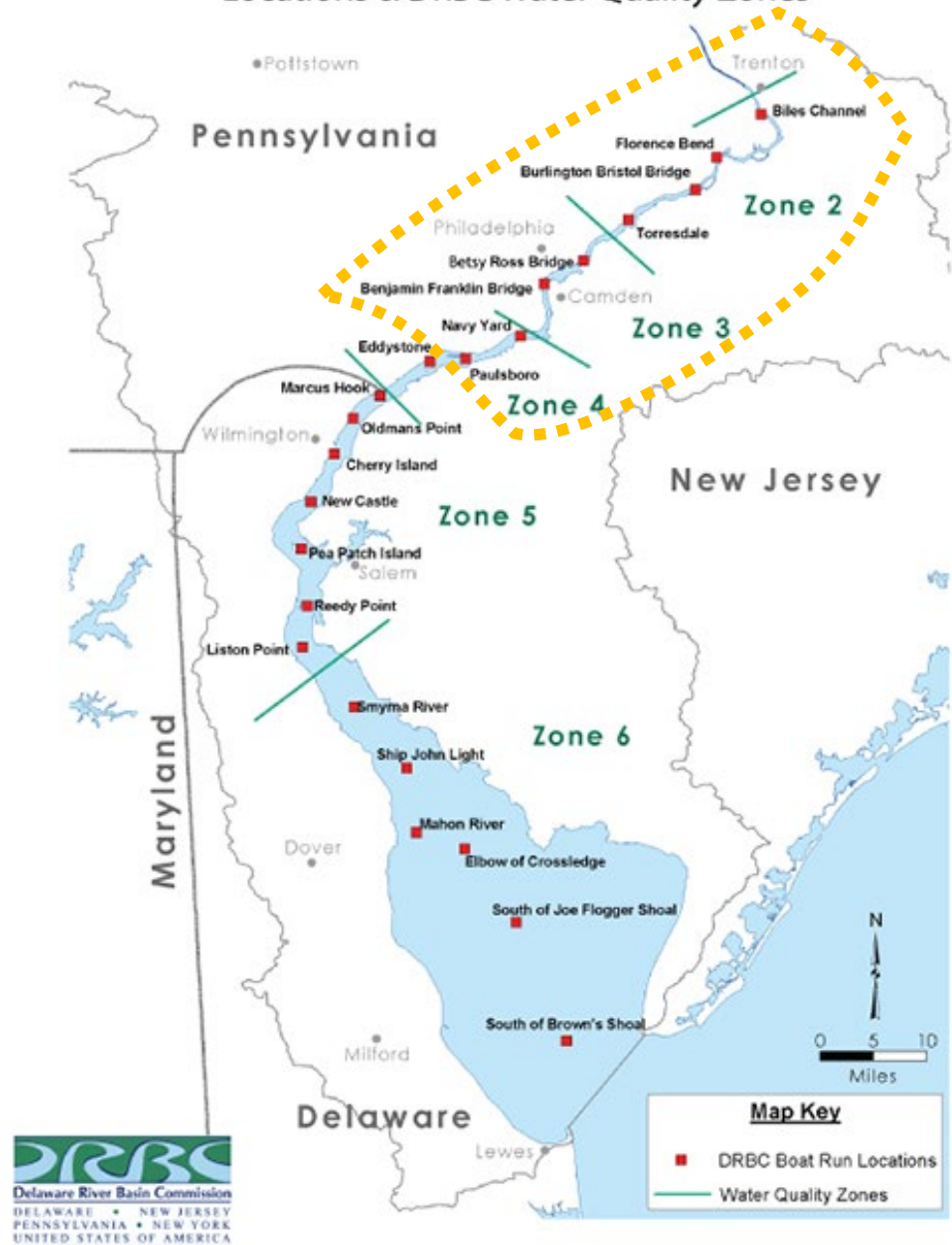
Common Name	Genus species	LC ₅₀ (ng L ⁻¹)			Test Duration	Citations (ITRC)
Coho salmon	Oncorhynchus kisutch	40	80	95	24	24, 25, 2
Brook trout	Salvelinus fontinalis	510			24	26
Rainbow trout/steelhead	Oncorhynchus mykiss	650	1,000	2,260	96	29, 3, 5
Chinook salmon	Oncorhynchus tshawytscha	67,300	82,100			24, 25
Sockeye salmon	Oncorhynchus nerka	>50,000			24	25
Atlantic Salmon	Salmo salar	>12,200			48	28
Brown trout	Salmo trutta	>12,200			48	28
Arctic char	Salvelinus alpinus	>12,700			24	3
Sothern Dolly varden	Salvelinus curilus	>3,800			48	26
Cherry salmon	Oncorhynchus masou masou	>3,500			48	26

What We Know: 6-PPD and 6PPD-quinone, ITRC 2023, Table 1.

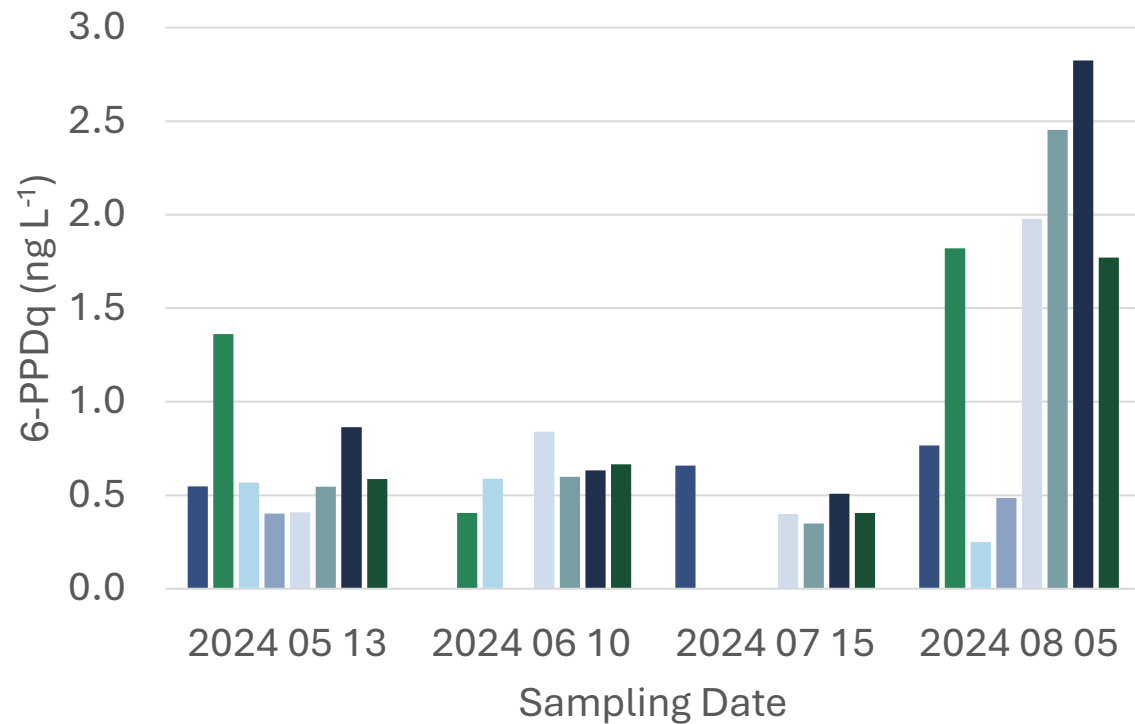


6-PPDq – Boat Run Study

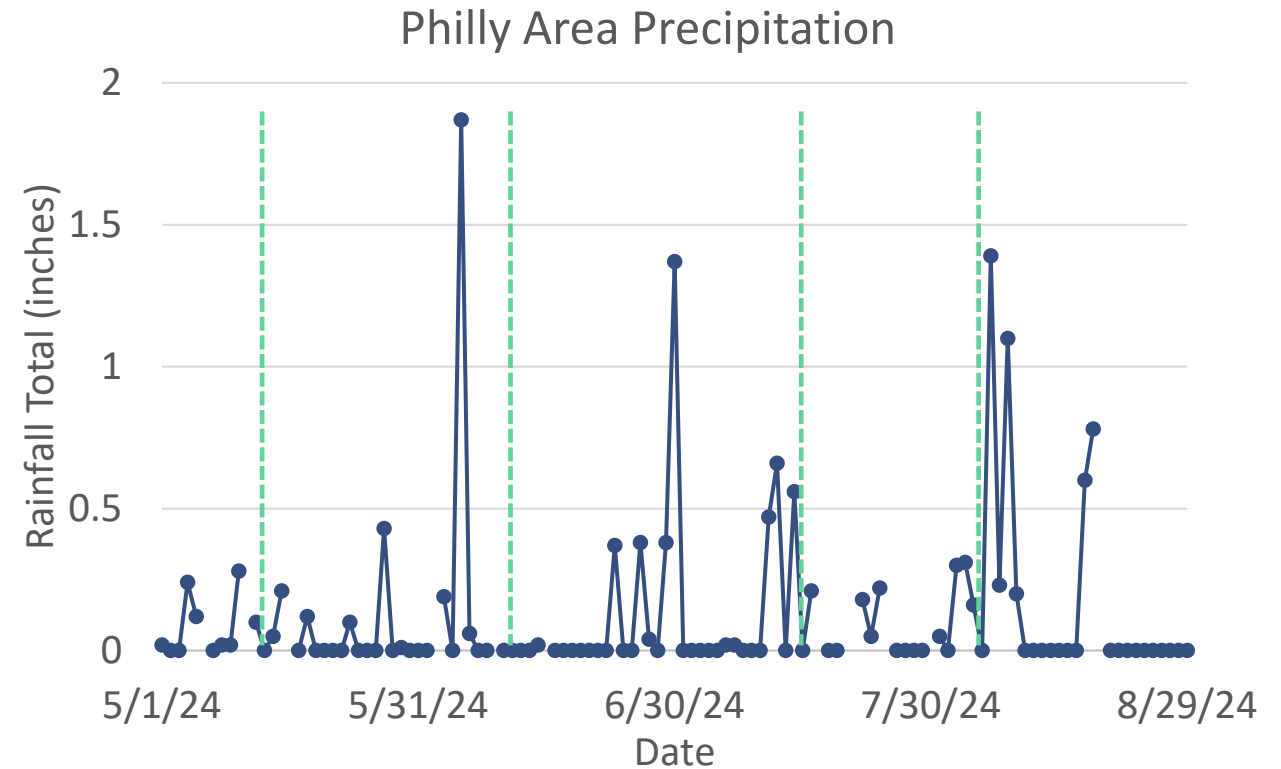
Delaware Estuary Water Quality Monitoring Program Locations & DRBC Water Quality Zones



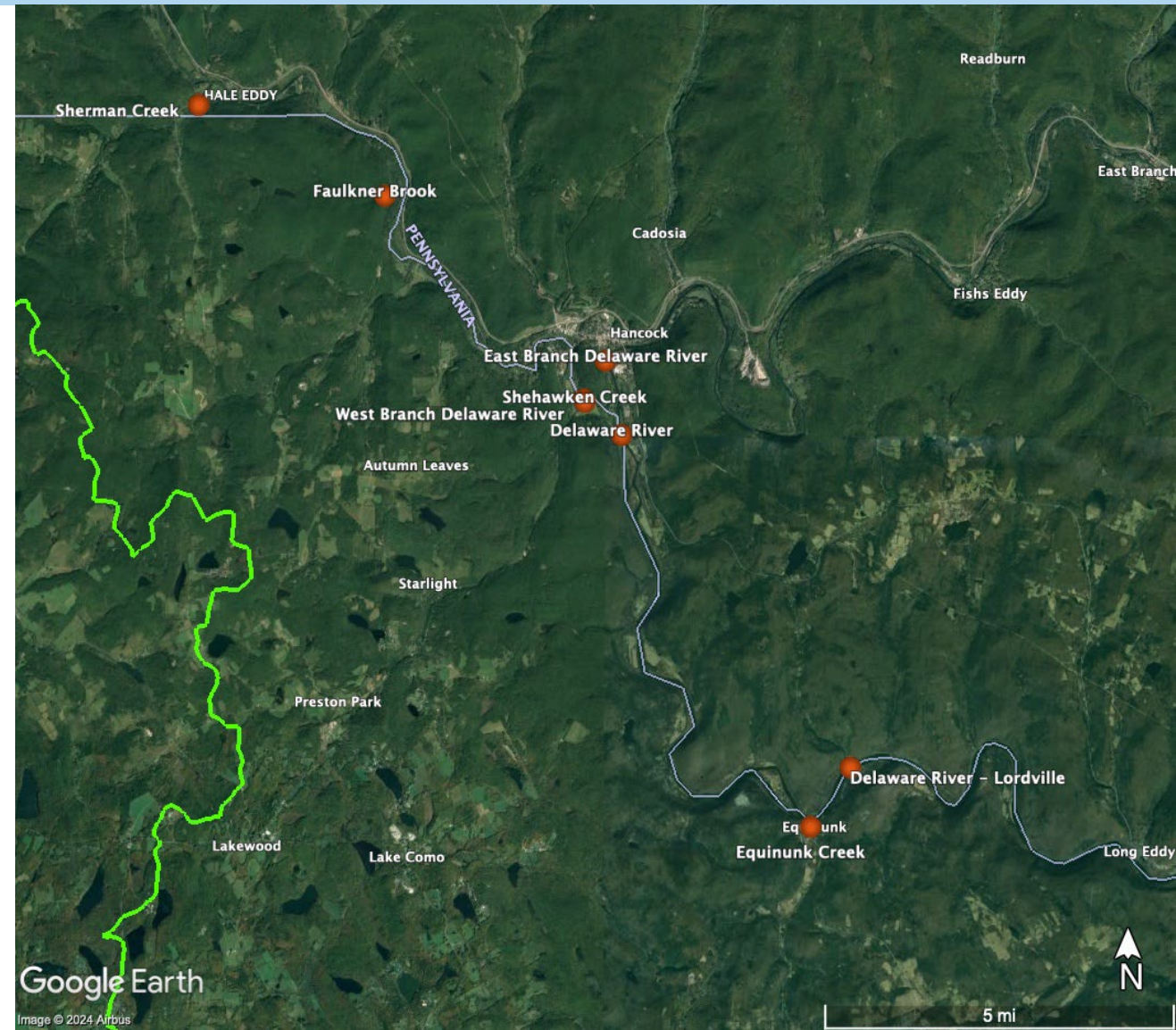
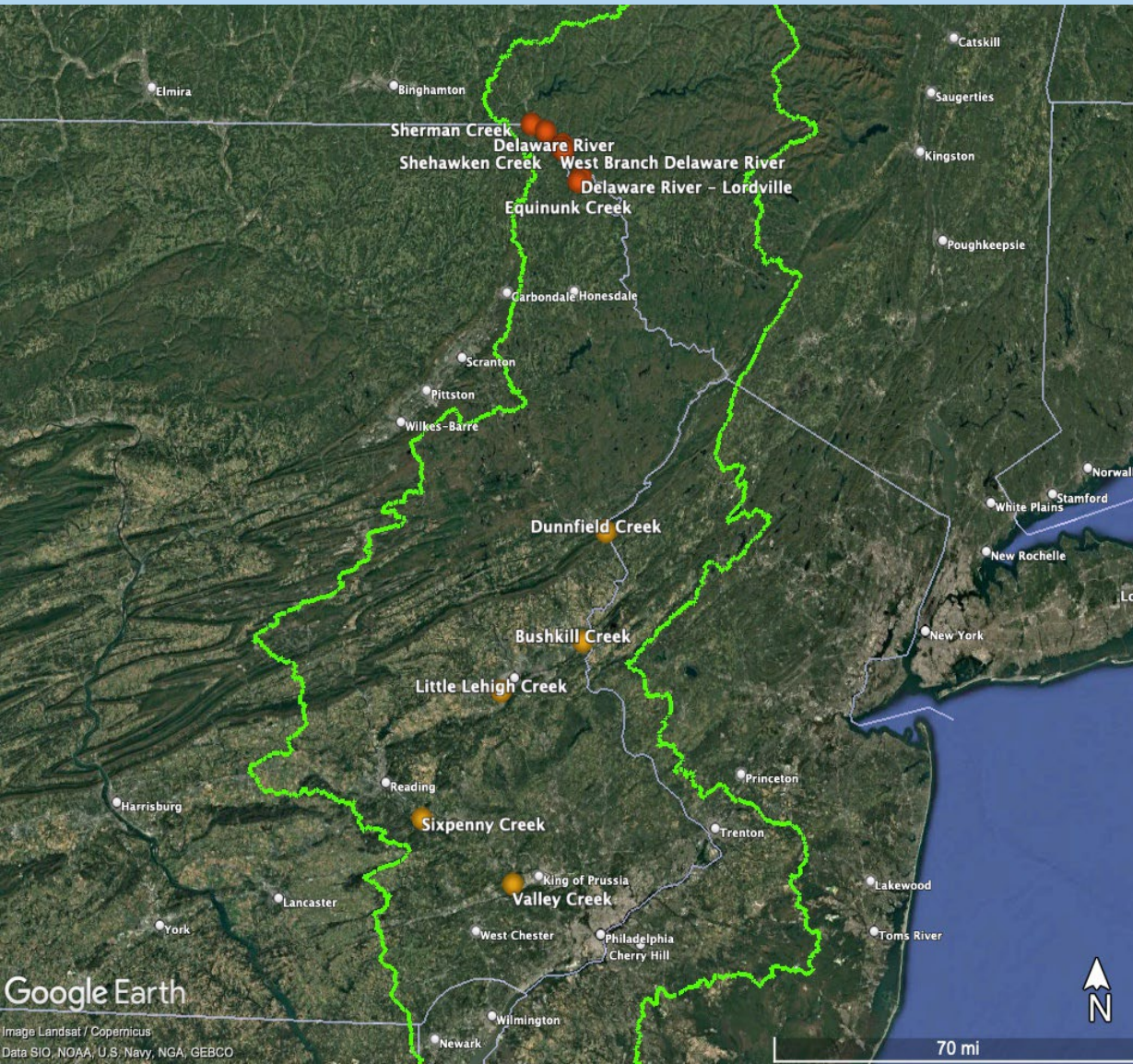
6-PPDq – Boat Run Data



■ BC (131) ■ FL (122) ■ BU (117) ■ TD (110)
■ BR (104) ■ BF (100) ■ NY (93) ■ PB (87)



6-PPDq – NFWF



6-PPDq – NFWF



Sampling Site	Sampling Date		
	Quarterly 4/24 & 25	Rain Event 6/10	Quarterly 7/23 & 24
	ng L ⁻¹		
Sherman Creek	*BD	^NS	BD
Faulkner Brook	BD	NS	BD
Delaware River - East Branch	1.81 ± 0.03	NS	BD
Delaware River - West Branch	BD	NS	BD
Shehawken Creek	BD	NS	0.35 ± 0.08
Delaware River - Hancock	BD	NS	0.78 ± 0.19
Equinunk Creek	BD	NS	BD
Delaware River - Lordville	0.17 ± 0.03	NS	BD
Dunnfield Creek	1.51	NS	0.51 ± 0.06
Bushkill Creek	BD	3.83 ± 0.28	0.39 ± 0.08
Little Lehigh Creek	0.83 ± 0.36	8.53 ± 1.17	0.57 ± 0.13
Sixpenny Creek	1.84 ± 1.12	BD	2.63 ± 0.95
Valley Creek	BD	1.05 ± 0.09	42.83 ± 2.62
Valley Creek Tributary	NS	NS	150.52 ± 0.48

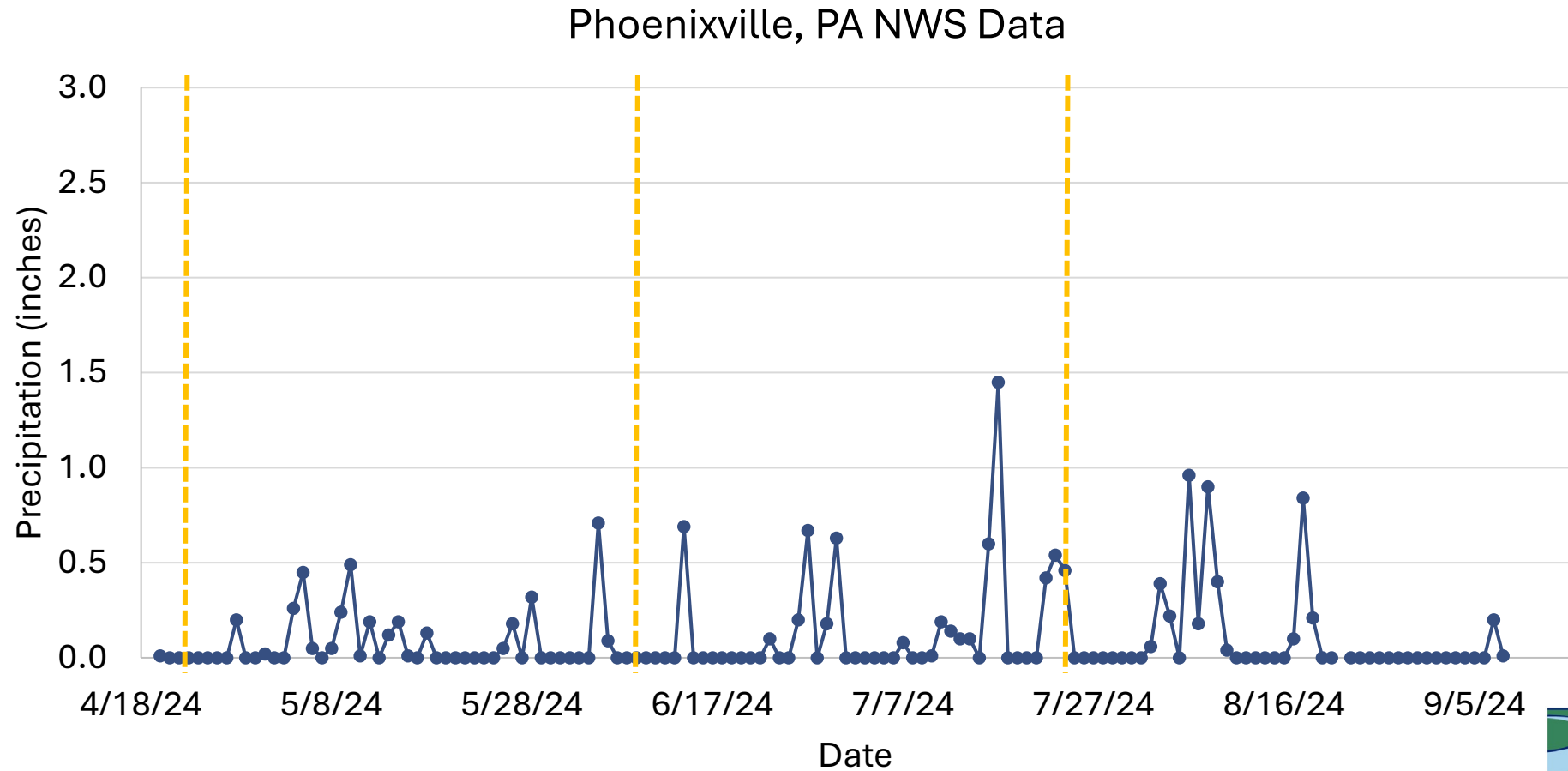
*BD = Below Detection Limits; ^NS = Not sampled

Future Sampling

Quarterly Sampling: 11/24, 1/25 & 4/25

Sampling after rain events

6-PPDq



6-PPDq in the Delaware Basin... So Far

- 6-PPDq is in the basin
 - Regularly see it in the mainstem from Trenton to Paulsboro
 - Most of our tributary samples are below-detection
 - Highest concentration associated with runoff events
- Below **known** toxicity thresholds for species in the basin
 - No sublethal thresholds have been established... that I know of



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Preliminary work shows that while 6-PPDq is not present at acute levels daily, stormwater events may temporarily spike concentrations to levels of concern in the lower basin

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Thanks to NFWF DWCF, Elaine Panuccio, Sum
Harris, Carl Bargery



What's going on in our water?

Staying Informed – *How can we understand the nature and extent of this issue in our Basin?*



Local groups can play a vital role connecting science and communities.



Looking Ahead





*Fishing for
local
knowledge*



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Slide 6: Carl LaVO, Keith Balderston

Slide 29: Sweetwater Guide Service



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